CLAIMS

1. An electro-optical cell (1, 18) comprising first and second support members (2, 3) at least one of which is transparent to optical radiation (6),

a suspension of anisometric particles between the support members (5), and

an electrode arrangement (11, 12) on at least the first support member (2) to apply a first electric field to the particle suspension (5) in such a manner that at least a major proportion of the particles (4) are aligned in an oblique configuration relative to the support members (2, 3) in a predetermined region thereof so as to guide obliquely the optical radiation (6) passing between the support members.

2. An electro-optical cell (1, 18) of claim 1 wherein the electrode arrangement (11, 12) is on both the first and second support members (2, 3).

3. A display (28, 32) comprising:
a source (25) of optical radiation (6),
a display device comprising an array of pixels (23, 24), and
a plurality of electro-optical cells (1,18) as claimed in claim 1 or 2.

4. A display (28, 32) of claim 3 wherein different ones of the electro-optical cells (1, 18) are configured to direct the optical radiation in different directions.

5. A display (28, 32) of claim 4 wherein a first group of the electro-optical cells (18a) are configured to direct the optical radiation to the left eye and a second group (18b) of the electro-optical cells are configured to direct the optical radiation to the right eye.

6. A display (28, 32) of claim 5 wherein the electro-optical cells of the first group are interspersed with the electro-optical cells of the second group in recurring patterns.

7. A display (28, 32) of claim 6 wherein the pattern comprises a pair of electro-optical cells (18a, 18b) containing a first and a second electro-optical cell,

the first electro-optical cell (18a) deflects the optical radiation to the left eye,

the second electro-optical cell (18b) deflects the optical radiation to the right eye, and

a plurality of said pairs are aligned side by side in a line.

8. A display (28, 32) of claim 3 wherein the electro-optical cell (1, 18) is further configured such that optical radiation (6) from the source (25) incident in a first direction on the electro-optical cell (1, 18) is split into a first beam (8, 10) generally parallel to the first direction to be directed to one eye and a second beam (9) in an oblique direction corresponding to the oblique particle configuration to be directed to the other eye.

9. A display (28, 32) of any one of claims 3 to 8 wherein the electro-optical cells (1, 18) comprises three electrodes (11a, 11b, 11c) on the first support member forming a first row (R1),

each of the three electrodes has an oppositely aligned electrode on the second support member (12a, 12b, 12c), and

the electrodes on the first and second support member are configured to be asymmetrically charged in order to apply the first electric field.

10. A display (28, 32) of claim 9 further comprising means for reducing the number of degrees of freedom of the suspended anisometric particle (16, 17).

11. A display (28, 32) according to claim 10 wherein the means for reducing the number of degrees of freedom of the particle comprise the electro-optical cell (18) having another two rows of electrodes (R2, R3), identical to the first row, in a matrix, on the first support member (2), and each of the electrodes in the three rows (11a-11i) has an oppositely aligned electrode on the second support member (12a-12i) and the electrodes on the first and second support members are operable to apply an electric field perpendicular to the first electric field such that the suspended particle (17) is forced to align with both fields.

12. A display (28, 32) of claim 3 wherein the electro-optical (18, 1) cell is configured such that optical radiation incident (6) in a first part of the cell is partly deflected to the left eye and optical radiation (6) incident in a second part of the cell is partly deflected to the right eye.

13. A display (28, 32) of claim 12 wherein the electro-optical (18, 1) cell comprise electrodes (11a-11e) on the first support member (2) forming a second row (R1),

each of the five electrodes have an oppositely aligned electrode (12a-12e) on the second support member (3), and

the electrodes on the first and second support member can be addressed to create a first electric field in order to align the particles (4) such that optical radiation (6) entering the cell to the left of the centre is to be partly deflected to the left eye and optical radiation entering the cell to the right of the centre is to be partly deflected to the right eye.

14. A display (28, 32) of claim 13 wherein the second row (R1) comprises five electrodes.

15. A display (28, 32) of claim 14 further comprising means for reducing the number of degrees of freedom of the suspended particles (16, 17).

16. A display (28, 32) of claim 15 wherein the means for reducing the number of degrees of freedom of the suspended particles (16, 17) comprise the electro-optical cell (18) having another two rows (R2, R3) identical and adjacent to the second row (R1) in a matrix on the first support member (2) and each of the electrodes (11a-11o) of the matrix has an oppositely aligned electrode (11a-12o) on the second support member (3) and the electrodes on the first and second support member are configured to create an additional electric field that forces the particles (17) to align with both electric fields.

17. A display (28, 32) of any one of the claims 4 to 16 wherein the optical radiation (6) intended for the right eye subsequently passes through display pixels operable to contain information for the right eye (24), the optical radiation intended for the left eye subsequently passes through display pixels operable to contain information for the left eye (23),

and wherein the combination of the information for the left and right eye allows the construction of a 3D image.

18. A display (28, 32) of claim 17 that is operable to provide a first display window, which is switchable into transmissive mode,

wherein the size of the window corresponds to the size of a group of electro-optical cells (1, 18),

said group comprises at least one electro-optical cell,

the electro-optical cells of the group are operable to apply an electric field, perpendicular to the support members (2, 3), to the particle suspensions (5) of said group in such a manner that at least a major proportion of the particles (4) in said group are aligned in a configuration generally perpendicular to the support members in a predetermined region thereof so as to cause negligible obstruction to the optical radiation (6) passing between the support members.

19. A display (28, 32) of claim 18 wherein the optical radiation (6) passing through said first window is subsequently passed through pixels (23, 24) operable to contain information for the construction of a 2D image such that the window can be switched between a 2D and 3D display mode.

20. A display (28, 32) of claim 18 or 19 that is operable to provide a second window which is switchable to reflective mode,

wherein the size of the window corresponds to the size of a group of electro-optical cells (1, 18),

said group comprises at least one electro-optical cell, and

the electro-optical cells of the group are operable to apply an electric field, aligned with the support members (2, 3), to the particle suspensions (5) of said group in such a manner that at least a major proportion of the particles (4) in said group are aligned with the support members (2, 3) in a predetermined region thereof so as to reflect the optical radiation (6) passing between them.

21. A display (28, 32) of claim 20 wherein the first window is the same as the second window.

22. A display (28) of any one of claims 3 to 21 wherein the electro-optical cells (1, 18) are positioned between the source of optical radiation (25) and the display device (23, 24).

23. A display (28) of claim 22 wherein the display device (23, 24) is a liquid crystal device.

24. A display (28) of claim 22 or 23 wherein the pixels (23, 24) are operable to contain information for a 2D image such that when said second window is in a reflective mode ambient light can be reflected to construct a 2D image in said second window.

25. A display (32) of any one of claims 3 to 21 wherein the electro-optical cells (1, 18) are positioned in front of the display device (23, 24).

26. A display (32) of claim 25 wherein the display device (23, 24) comprises an emissive display, such as a polyLED device, a Cathode Ray Tube (CRT), a plasma display, a field emission display, back-lit light valve display or an OLED display.

27. A display (32) of claim 25 or 26 wherein the second window appears to be a mirror when the second window is in a reflective mode.

28. A display (28, 32) of any one of claims 3 to 27 wherein the angle of deflection can be adjusted to accommodate different users or operation at different distances.

29. A display (28, 32) of any one of the preceding claims comprising driving electronics to change the potential of the electrodes (11, 12) in order to switch the orientation of the suspended anisometric particles (4).